Missouri
Department
of Transportation

MoDOT

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# ADDENDUM 002
# REQUEST FOR Quotation
# Wireless Radio Modem
# RFQ NUMBER: Q10-09216-RG

Offerors shall acknowledge receipt of Addendum 001 (ONE) by signing and including it with the original bid. The bid specifications have been changed by this Addendum. Accordingly, the following clarifications, are believed to be of general interest to all potential Offerors. All other terms and conditions remain unchanged and in full force.

| | |
|---|---|
| Name and Title of Signer<br>(Print or type) | Name and Title of Department Authority<br><br>Ronnie Cluck<br>Procurement |
| Contractor/Offeror Signature<br><br>(Signature of person authorized to sign) | Department of Transportation<br><br>(Authorizing Signature) |
| Date Signed: | Date Signed: |

**GENERAL CLARAFICATIONS**

***Page1, The bid states that the specifications are on an attached sheet. The specification was not attached to the bid form. The specifications are attached to this addendum for bid number Q10-09216-RG.***

**RFQ#**

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# JOB SPECIAL PROVISIONS

## A WIRELESS RADIO MODEM

**1.0 Description:** The wireless radio modem (RF modem) shall be used to transmit data in a point-to-point configuration. All radios shall be Frequency Hopping Spread Spectrum (FHSS) Technology. The Radio modem shall meet the following minimum specifications:

**A. Radio**

| | |
|---|---|
| Technology: | FHSS |
| Frequency Range: | 902 – 928 MHz |
| Output Power: | 1mW, 10mW, 100mW or 1 Watt |
| Software Programmable: | Yes |
| Available Hop Patterns: | 44 |
| Number of RF Channels: | 110 |
| Error Checking: | 16 Bit-CRC |
| Error Correction: | Forward Error Correction |
| Receiver Sensitivity / BER: | -108 dBm @ $10^{-6}$ BER |
| System Gain: | 140 dBm |
| Antenna Port: | RP TNC-F or N-F |
| Certification: | FCC, Industry Canada |
| Operating Modes: | Master, Slave, Slave/Repeater, Repeater |
| Input Power: | 6 – 30VDC |
| Power Consumption: | Typical < 100mA (standby) |
| Operating Temperature: | -40°C to +75°C |
| Humidity: | 95% Non-Condensing |
| Dimensions: | 8.0" W x 8.0" H x 8.0" D |
| Enclosure: | Aluminum |

**B. Software**

| | |
|---|---|
| Radio Configuration: | Yes |
| Spectrum Analyzer: | Yes |
| Remote Diagnostics: | Yes |
| Configuration: | Local and Remote |
| Windows Based: | Yes |

**C. Interface:**

| | |
|---|---|
| Programming Port: | DB9-F or DE9-F |
| Data Interface: | Standard RS232 Asynchronous |
| Controller Baud Rates Supported: | 1200, 2400, 4800, 9600, 19200 |
| Data Throughput: | 1200bps – 115Kbps |

**D. Indicators:**

| | |
|---|---|
| TX Data, RX Data, PWR: | Yes |

E.

**F. Additional Requirements:**

- A power supply unit and cable shall be provided to supply power to the RF Modem.
- A Data Cable to connect the communication port of the RF Modem to the RS232 port of an EPAC M40 Controller shall be provided with each RF Modem Unit.
- A RF Jumper Cable to connect the RF Modem to the Lightning Arrestor inside the cabinet. This cable shall be constructed out of RG-58 or LMR 400 cable, be a minimum of 3 feet in length, and have appropriate connectors affixed to connect to the Lightning Arrestor and the RF Modem.

**2.0 Basis of Payment:** The payment for this item will be made for the accepted number of quantities at the contract price.

| Item Description | Unit of Measure |
|---|---|
| Wireless Radio Modem | Each |

## B LIGHTNING ARRESTOR

**1.0 Description:** A lightning arrestor shall be used for protection of the radio equipment. The lightning arrestor shall meet the following minimum requirements.

| | |
|---|---|
| Frequency Range: | 125 MHz to 1000 MHz |
| VSWR: | ≤ 1.3:1 over frequency range |
| Insertion Loss: | ≤ 0.1 dB over frequency range |
| Max Power: | 375 W at 125 MHz, 50 W at 1 Ghz |
| Turn on: | 600 VDC ± 20% 2.5 ns for 2 kV / ns |
| Surge: | 50 kA IEC 1000-4-5 8/20 µs Waveform 500 J |
| Vibration: | 1G up to 100 Hz |
| Protected Side Connector: | N female 50 Ω |
| Surge Side Connector: | N female 50 Ω |
| Throughput Energy: | ≤ 200 µJ |
| Throughput Voltage: | ≤ 3 Vpk |
| Unit Impedance: | 50 Ω |
| Operating Temperature: | -40°C to +75°C |

**2.0 Basis of Payment:** The payment for this item will be made for the accepted number of quantities at the contract price.

| Item Description | Unit of Measure |
|---|---|
| Lightning Arrestors | Each |

## C YAGI ANTENNA

**1.0 Description:** The Yagi Antenna shall be a medium or high gain directional antenna. The antenna shall be connected to the wireless radio modem for short haul data transmission in a point-to-point configuration. The Yagi antenna shall meet the following minimum specifications.

| | |
|---|---|
| Frequency: | 902 – 928 MHz |
| Gain | 8.5 dBi |
| Polarization: | Horizontal or Vertical |
| Horizontal Beam Width: | 50° |
| Vertical Beam Width: | 45° |
| Front to Back Ratio: | 14 dB |
| Impedance: | 50 Ohm |
| Power Rating: | 200 Watts |
| VSWR: | 2:1 Max |
| Connector Type: | N-Female |
| Construction: | Welded Stainless Steel or Aluminum |
| Wind Loading: | 100 mph |
| Operating Temperature: | -40°C to +75°C |
| RoHS Compliant: | Yes |

All necessary mounting hardware shall be included with antenna for mounting to 2 in. diameter, vertical post.

**2.0 Basis of Payment:** The payment for this item will be made for the accepted number of quantities at the contract price.

| Item Description | Unit of Measure |
|---|---|
| Yagi Antenna | Each |

## D OMNI ANTENNA

**1.0 Description:** The Omni Antenna shall be a medium or high gain directional antenna. The antenna shall be connected to the wireless radio modem for short haul data transmission in a point-to-point configuration. The Omni antenna shall meet the following minimum specifications.

| | |
|---|---|
| Frequency: | 902 – 928 MHz |
| Gain | 5 dB |
| Polarization: | Vertical |
| Vertical Plane: | 22° |
| Radome Material: | 0.65 in. pultruded white fiberglass |
| Connector Type: | Recessed Type N Female or<br>N-Male with 16" jumper cable |

| | |
|---|---|
| Wind Survival: | 100 mph |
| Operating Temperature: | -40°C to +75°C |
| Power Rating: | 150 Watts |
| VSWR: | 2:1 Max |

All necessary mounting hardware shall be included with antenna for mounting to 2 in. diameter, vertical post.

**2.0 Basis of Payment:** The payment for this item will be made for the accepted number of quantities at the contract price.

| Item Description | Unit of Measure |
|---|---|
| Omni Antenna | Each |

## E LMR 400 COAXIAL CABLE

**1.0 Description:** LMR 400 Coaxial Cable shall be used to provide a link between the antenna and the lightning arrestor. The cable shall meet the following minimum requirements.

| | |
|---|---|
| Attenuation: | 3.9 dB / 100 ft. at 900 MHz |
| Power Rating: | 0.58 kW at 900 MHz |
| Center Conductor: | 0.109 in. Copper Clad Aluminum |
| Dielectric: | 0.285 in. Cellular PE |
| Shield: | 0.291 in. Aluminum Tape |
| | 0.320 in. Tinned Copper Braid |
| Jacket | Black UV protected polyethylene |
| Bend Radius: | 1 in with less than 1 Ω impedance change at bend |
| Impedance: | 50 Ω |
| Capacitance: | 23.9 pf/ft |

**2.0 Basis of Payment:** The payment for this item will be made for the accepted number of quantities at the contract price.

| Item Description | Unit of Measure |
|---|---|
| LMR 400 Cable | LF |

## F TYPE N CONNECTORS

**1.0 Description:** Type N Connectors shall be used to terminate the ends of the LMR 400 Coaxial Cable. The connectors shall meet the following minimum requirements.

| | |
|---|---|
| Connector Type: | N Male Solder or Crimp Contact |
| Impedance: | 50 Ω |
| VSWR: | 1.5:1 Max |
| Frequency: | 902 – 928 MHz |
| Operating Temperature: | -40°C to +75°C |
| Power Rating: | 0.58 kW at 900 MHz |

**2.0 Basis of Payment:** The payment for this item will be made for the accepted number of quantities at the contract price.

| Item Description | Unit of Measure |
|---|---|
| Type N Connector | Each |